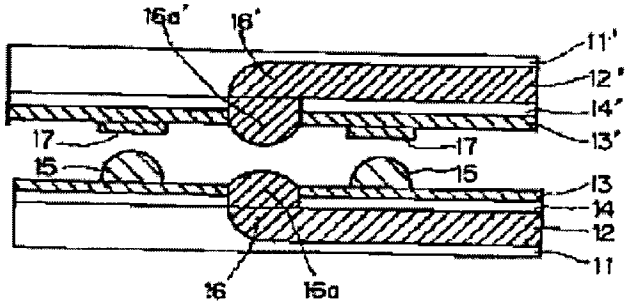
FORMATION OF OPTO-ELECTRIC TRANSMISSION PATH AND OPTO-ELECTRIC WIRING BOARD

Publication number: JP9281352
Publication date: 1997-10-31
Inventor: TAGUCHI MASAHIRO; OZAWA TAKASHI; FUNADA MASAO; OKADA JUNJI; HIROTA MASANORI; KONO KENJI
Applicant: FUJI XEROX CO LTD
Classification:
- international: ***G02B6/13; H01L27/15;*** **G02B6/13; H01L27/15;** (IPC1-7): G02B6/13; H01L27/15
- European:
Application number: JP19960088045 19960410
Priority number(s): JP19960088045 19960410

Report a data error here

Abstract of **JP9281352**

PROBLEM TO BE SOLVED: To provide a method for forming novel opto-electric transmission paths by optically and electrically connecting the opto-electric transmission paths, optical transmission paths, opto-electric elements, optical elements, etc., to each other with good coupling efficiency by a simple method and an opto- electric wiring board having overall efficiency. SOLUTION: This wiring board is formed by preparing two sheets of substrates 11, 11' forming respective core layers 12, 12' having optical junctures 16, 16' bearing incidence-exit of light on the respective substrates 11, 11', forming respective conductive layer 13, 13' stuck by adhesives 14, 14' consisting of material acting as clads to the respective core layers 12, 12' onto the substrates 11, 11', forming conductive projections 15 for electrical connection on the conductive layers 13 and sticking the substrates 11, 11' in such a manner that the optical junctures 16, 16' are optically connected to each other and that the respective conductive layers 13, 13' electrically connected to each other via the projections 15.



Data supplied from the ***esp@cenet*** database - Worldwide

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

特開平9－281352

(43)公開日　平成９年(1997)10月31日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ		技術表示箇所
Ｇ０２Ｂ　6/13			Ｇ０２Ｂ　6/12	Ｍ	
Ｈ０１Ｌ　27/15			Ｈ０１Ｌ　27/15	Ｃ	

審査請求　未請求　請求項の数７　ＯＬ　（全 11 頁）

(21)出願番号　特願平8－88045

(22)出願日　平成８年(1996)４月10日

(71)出願人　000005496
富士ゼロックス株式会社
東京都港区赤坂二丁目17番22号

(72)発明者　田口　正弘
神奈川県足柄上郡中井町境430　グリーンテクなかい　富士ゼロックス株式会社内

(72)発明者　小澤　隆
神奈川県足柄上郡中井町境430　グリーンテクなかい　富士ゼロックス株式会社内

(72)発明者　舟田　雅夫
神奈川県足柄上郡中井町境430　グリーンテクなかい　富士ゼロックス株式会社内

(74)代理人　弁理士　山田　正紀　（外１名）

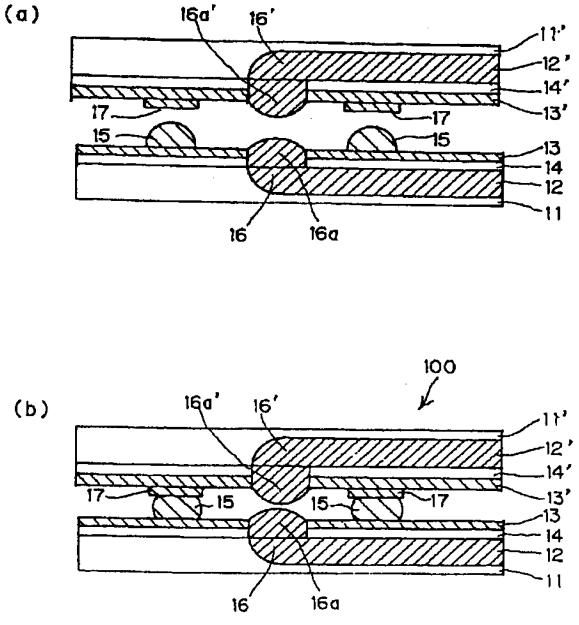
最終頁に続く

(54)【発明の名称】　光電気伝送路の形成方法及び光電気配線基板

(57)【要約】

【課題】簡単な方法で結合効率よく、光電気伝送路、光伝送路、光電素子、光学素子などを相互に光学的かつ電気的に接続して新たな光電気伝送路を形成する方法、及び結合効率のよい光電気配線基板を提供することを目的とする。

【解決手段】２枚の基板１１，１１’を用意し、基板１１，１１’それぞれに光の入射／出射を担う各光接続部１６，１６’を有する各コア層１２，１２’を形成し、基板１１，１１’上に各コア層１２，１２’に対するクラッドとして作用する材料から成る接着剤１４，１４’により貼着された各導電層１３，１３’を形成し、導電層１３上に電気的接続のための導電性の突起１５を形成し、光接続部１６，１６’どうしが光学的に接続されると共に各導電層１３，１３’どうしが突起１５を介して電気的に接続されるように基板１１，１１’を貼り合わせることにより光電気配線基板１００を形成する。



1

【特許請求の範囲】

【請求項１】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、

前記２枚の基板の前記各コア層が形成された側の面上の、該各コア層の上面及び各所定の経路に沿って、該各コア層に対するクラッドとして作用する材料から成る接着剤により貼着された各導電層を形成する工程と、

前記２枚の基板上に形成された導電層のうちの少なくとも一方に、これら２枚の基板上の導電層を相互に電気的に接続するための導電性の突起を形成する工程と、

前記２枚の基板上の前記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の前記導電層どうしが前記突起を介して電気的に接続されるようにこれら２枚の基板を貼り合わせる工程とを有することを特徴とする光電気伝送路の形成方法。

【請求項２】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する第１の基板を用意し、該第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、

前記第１の基板の前記コア層が形成された側の面上の、該コア層の上面及び所定の経路に沿って、該コア層に対するクラッドとして作用する材料から成る接着剤により貼着された第１の導電層を形成する工程と、

第２の基板を用意して、該第２の基板の、前記第１の基板上に形成されたコア層の前記光接続部に対応する位置に、該光接続部に入射する光の発光を担う発光素子と、該光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、該第２の基板上の所定の経路に沿って第２の導電層を形成する工程と、

前記第１の導電層と前記第２の導電層のうちの少なくとも一方に、該第１の導電層と該第２の導電層を電気的に接続するための導電性の突起を形成する工程と、

前記光接続部と前記素子が光学的に接続されると共に、前記第１の導電層と前記第２の導電層が前記突起を介して電気的に接続されるように前記第１の基板と前記第２の基板を貼り合わせる工程とを有することを特徴とする光電気伝送路の形成方法。

【請求項３】　前記第１の導電層を、前記光接続部を取り囲むように形成すると共に、前記第２の導電層を、前記素子を取り囲むように形成し、さらに、前記突起を、前記第１の基板と前記第２の基板が貼り合わされた際に該突起が該光接続部と該素子を取り囲むように形成することを特徴とする請求項２記載の光電気伝送路の形成方法。

2

【請求項４】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、

前記２枚の基板の前記各コア層が形成された側の面上の、該各コア層の上面及び各所定の経路に沿って、該各コア層に対するクラッドとして作用する材料から成る接着剤により貼着された各導電層を形成する工程と、

前記２枚の基板上に形成された導電層のうちの少なくとも一方に、これら２枚の基板上の導電層を相互に電気的に接続するための導電性の突起を形成する工程と、

前記２枚の基板上の前記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の前記導電層どうしが前記突起を介して電気的に接続されるようにこれら２枚の基板を貼り合わせる工程とを経て形成された光電気配線基板。

【請求項５】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する第１の基板を用意し、該第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、

前記第１の基板の前記コア層が形成された側の面上の、該コア層の上面及び所定の経路に沿って、該コア層に対するクラッドとして作用する材料から成る接着剤により貼着された第１の導電層を形成する工程と、

第２の基板を用意して、該第２の基板の、前記第１の基板上に形成されたコア層の前記光接続部に対応する位置に、該光接続部に入射する光の発光を担う発光素子と、該光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、該第２の基板上の所定の経路に沿って第２の導電層を形成する工程と、

前記第１の導電層と前記第２の導電層のうちの少なくとも一方に、該第１の導電層と該第２の導電層を電気的に接続するための導電性の突起を形成する工程と、

前記光接続部と前記素子が光学的に接続されると共に、前記第１の導電層と前記第２の導電層が前記突起を介して電気的に接続されるように前記第１の基板と前記第２の基板を貼り合わせる工程とを経て形成された光電気配線基板。

【請求項６】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、

前記２枚の基板の前記各コア層が形成された側の面上に、前記光接続部を取り囲むように、該各コア層に対す

るクラッドとして作用する各クラッド層を形成する工程と、
前記２枚の基板上に形成されたクラッド層のうちの少なくとも一方に、これら２枚の基板が貼り合わされた際に、前記２枚の基板の前記光接続部どうしの光結合部分を取り囲む突起を形成する工程と、
前記２枚の基板上の前記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の前記光結合部分が前記突起により光学的に外部と遮閉されるようにこれら２枚の基板を貼り合わせる工程とを有することを特徴とする光電気伝送路の形成方法。
【請求項７】　光の伝送路となるコア層が形成される、該コア層に対するクラッドとして作用する第１の基板を用意し、該第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、
前記第１の基板の前記コア層が形成された側の面上に、該コア層に対するクラッドとして作用する材料から成る第１のクラッド層を形成する工程と、
第２の基板を用意して、該第２の基板の、前記第１の基板上に形成されたコア層の前記光接続部に対応する位置に、該光接続部に入射する光の発光を担う発光素子と、該光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、該第２の基板上に第２のクラッド層を形成する工程と、
前記第１のクラッド層と前記第２のクラッド層のうちの少なくとも一方に、前記第１の基板と前記第２の基板が貼り合わされた際に、前記第１の基板の前記光接続部と、前記第２の基板の前記発光素子及び前記受光素子のうちのいずれか一方の素子との光結合部分を取り囲む突起を形成する工程と、
前記光接続部と前記素子が光学的に接続されると共に、前記光結合部分が前記突起により光学的に外部と遮閉されるように前記第１の基板と前記第２の基板とを貼り合わせる工程とを有することを特徴とする光電気伝送路の形成方法。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、光電気伝送路、光伝送路、光電素子、光学素子などを相互に光学的かつ電気的に接続して新たな光電気伝送路を形成する光電気伝送路の形成方法及びその方法により形成された光電気配線基板に関する。
【０００２】
【従来の技術】一般に、プリズムや回折格子などの光学素子とレーザダイオードやフォトダイオードなどの光電素子を光回路基板又は光電気配線基板に実装し、光学素子と光電素子を光学的に結合するには、光ファイバ、光伝送路またはこれら２つの組み合わせによって行われている。光素子と、光ファイバまたは光伝送路間の光回路

としての結合効率を最大にするためには、光素子と、光ファイバまたは光伝送路とを精度よく位置合わせする必要がある。また光電素子には電力や電気信号を供給する必要もある。
【０００３】従来、光回路基板に光素子を精度よく位置合わせして実装する方法として、例えば、”『ＡｕＳｎバンプ接合による光素子のセルフアライメント実装』、電気情報通信学会技術報告、ＯＱＥ９３－１４５（１９９３－１２）”に記載されているような、溶融はんだの表面張力を利用したセルフアライメント方法が広く知られている。この方法は、光回路基板に形成された配線パターン上にＡｕＳｎなどのバンプ（ハンダのボール）を置き、そのバンプの上に、結合すべき光素子を備えた基板の配線パターンを重ね合わせた上でバンプを加熱溶融し、溶融したハンダの表面張力による２つの基板の相対的移動により基板相互の位置ずれを修正させて、２つの基板の位置合わせを自動的に行わせようというものである。
【０００４】この方法には、位置合わせに用いられるバンプを利用して基板への電力供給や電気信号の伝送を行うことができるという利点があるが、その反面、この方法には、バンプを置く位置の精度が低いと２つの基板の光の結合効率を低下させることがあり、また、ハンダ用のフラックスが光素子に付着し易く、光素子の表面がフラックスにより汚染されることにより光の結合効率を低下させ易いという問題がある。
【０００５】その他の従来技術として、例えば、特開平６－１３６０１号公報には、電子基板の表面に光学素子を嵌め込む空所を複数設けると共に、その空所に嵌め込まれるべき光学素子相互間を接続するための光導波路を配置したアライメントキャリア構造体を形成する、光信号分配システムの形成方法が開示されている。この方法によれば、光学素子を嵌め込む空所は予め正確に位置決めされているので、光学素子を嵌め込む際の位置合わせ操作は不要となり、光学素子の着脱が容易となる利点がある。また、このシステムでは、光信号の分配だけでなく電力や電気信号の供給も電子基板上で行うことができる。
【０００６】しかし、この方法では、光学素子を嵌め込むための空所やこれら空所間を接続する光導波路を正確に位置決めした上で基板上に配置する必要があるため、構造が複雑となり、高精度でアライメントキャリア構造体を製造することが難しい。また、このアライメントキャリア構造体は、その構造上、端面で受発光するタイプの素子には適用し易いが、面発光レーザなどのような端面以外で受発光する素子に適用するのは難しいという問題もある。
【０００７】
【発明が解決しようとする課題】本発明は、上記の事情に鑑み、簡単な方法で結合効率よく、光電気伝送路、光

伝送路、光電素子、光学素子などを相互に光学的かつ電気的に接続して新たな光電気伝送路を形成する光電気伝送路の形成方法、及び結合効率のよい光電気配線基板を提供することを目的とする。

【０００８】

【課題を解決するための手段】上記の目的を達成する本発明の第１の光電気伝送路の形成方法は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、上記２枚の基板の上記各コア層が形成された側の面上の、各コア層の上面及び各所定の経路に沿って、各コア層に対するクラッドとして作用する材料から成る接着剤により貼着された各導電層を形成する工程と、上記２枚の基板上に形成された導電層のうちの少なくとも一方に、これら２枚の基板上の導電層を相互に電気的に接続するための導電性の突起を形成する工程と、上記２枚の基板上の上記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の上記導電層どうしが上記突起を介して電気的に接続されるようにこれら２枚の基板を貼り合わせる工程とを有することを特徴とする。

【０００９】また、上記の目的を達成する本発明の第２の光電気伝送路の形成方法は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する第１の基板を用意し、上記第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、上記第１の基板の上記コア層が形成された側の面上の、コア層の上面及び所定の経路に沿って、コア層に対するクラッドとして作用する材料から成る接着剤により貼着された第１の導電層を形成する工程と、第２の基板を用意して、第２の基板の、上記第１の基板上に形成されたコア層の上記光接続部に対応する位置に、光接続部に入射する光の発光を担う発光素子と、光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、第２の基板上の所定の経路に沿って第２の導電層を形成する工程と、上記第１の導電層と上記第２の導電層のうちの少なくとも一方に、第１の導電層と第２の導電層を電気的に接続するための導電性の突起を形成する工程と、上記光接続部と上記素子が光学的に接続されると共に、上記第１の導電層と上記第２の導電層が上記突起を介して電気的に接続されるように上記第１の基板と上記第２の基板を貼り合わせる工程とを有することを特徴とする。

【００１０】ここで、上記第１の導電層を、上記光接続部を取り囲むように形成すると共に、上記第２の導電層を、上記素子を取り囲むように形成し、さらに、上記突起を、上記第１の基板と上記第２の基板が貼り合わされた際に上記突起が光接続部と該素子を取り囲むように形成してもよい。また、上記の目的を達成する本発明の第１の光電気配線基板は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、上記２枚の基板の上記各コア層が形成された側の面上の、各コア層の上面及び各所定の経路に沿って、各コア層に対するクラッドとして作用する材料から成る接着剤により貼着された各導電層を形成する工程と、上記２枚の基板上に形成された導電層のうちの少なくとも一方に、これら２枚の基板上の導電層を相互に電気的に接続するための導電性の突起を形成する工程と、上記２枚の基板上の上記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の上記導電層どうしが上記突起を介して電気的に接続されるようにこれら２枚の基板を貼り合わせる工程とを経て形成されたものであることを特徴とする。

【００１１】また、上記の目的を達成する本発明の第２の光電気配線基板は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する第１の基板を用意し、第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、上記第１の基板の上記コア層が形成された側の面上の、コア層の上面及び所定の経路に沿って、コア層に対するクラッドとして作用する材料から成る接着剤により貼着された第１の導電層を形成する工程と、第２の基板を用意して、第２の基板の、上記第１の基板上に形成されたコア層の上記光接続部に対応する位置に、光接続部に入射する光の発光を担う発光素子と、光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、第２の基板上の所定の経路に沿って第２の導電層を形成する工程と、上記第１の導電層と上記第２の導電層のうちの少なくとも一方に、第１の導電層と第２の導電層を電気的に接続するための導電性の突起を形成する工程と、上記光接続部と上記素子が光学的に接続されると共に、上記第１の導電層と上記第２の導電層が上記突起を介して電気的に接続されるように上記第１の基板と上記第２の基板を貼り合わせる工程とを経て形成されたものであることを特徴とする。

【００１２】また、上記の目的を達成する本発明の第３の光電気伝送路の形成方法は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する２枚の基板を用意し、これら２枚の基板それぞれに、各所定の方向に延びると共に、互いに対応する位置に、光の入射と出射のうちの少なくとも一方をそれぞれ担う各光接続部を有する各コア層を形成する工程と、上記２枚の基板の上記各コア層が形成された側の面上に、

上記光接続部を取り囲むように、各コア層に対するクラッドとして作用する材料から成る各クラッド層を形成する工程と、上記２枚の基板上に形成されたクラッド層のうちの少なくとも一方に、これら２枚の基板が貼り合わされた際に、これら２枚の基板の上記光接続部どうしの光結合部分を取り囲む突起を形成する工程と、上記２枚の基板上の上記光接続部どうしが光学的に接続されると共に、これら２枚の基板上の上記光結合部分が上記突起により光学的に外部と遮閉されるようにこれら２枚の基板を貼り合わせる工程とを有することを特徴とする。

【００１３】また、上記の目的を達成する本発明の第４の光電気伝送路の形成方法は、光の伝送路となるコア層が形成される、そのコア層に対するクラッドとして作用する第１の基板を用意し、その第１の基板上に、所定の方向に延びると共に、光の入射と出射のうちの少なくとも一方を担う光接続部を有するコア層を形成する工程と、上記第１の基板の上記コア層が形成された側の面上に、そのコア層に対するクラッドとして作用する材料から成る第１のクラッド層を形成する工程と、第２の基板を用意して、第２の基板の、上記第１の基板上に形成されたコア層の上記光接続部に対応する位置に、光接続部に入射する光の発光を担う発光素子と、光接続部から出射する光の受光を担う受光素子のうちの少なくとも一方の素子を配置すると共に、第２の基板上に第２のクラッド層を形成する工程と、上記第１のクラッド層と上記第２のクラッド層のうちの少なくとも一方に、上記第１の基板と上記第２の基板が貼り合わされた際に、上記第１の基板の上記光接続部と、上記第２の基板の上記発光素子及び上記受光素子のうちのいずれか一方の素子との光結合部分を取り囲む突起を形成する工程と、上記光接続部と上記素子が光学的に接続されると共に、上記光結合部分が上記突起により光学的に外部と遮閉されるように上記第１の基板と上記第２の基板とを貼り合わせる工程とを有することを特徴とする。

【００１４】

【発明の実施の形態】以下、本発明の実施形態について説明する。図１は、本発明の第１の光電気伝送路の形成方法の一実施形態における第１の基板の形成過程のうちの前半部を示す工程図であり、図２は、本発明の第１の光電気伝送路の形成方法の一実施形態における第１の基板の形成過程のうちの後半部を示す工程図である。

【００１５】以下に、図１及び図２を参照しながら第１の基板の形成過程について説明する。先ず、光伝送路のクラッド層としての作用を兼ねた基板１１を用意し（図１（ａ））、等方性エッチング法により基板１１上に光の伝送路となるコア層形成用の溝１１ａを形成する（図１（ｂ））。次に、溝１１ａ内にコア層用材料を流し込みコア層１２を形成する（図１（ｃ））。コア層１２は、後述の、光の入射または出射を担う光接続部１６を始点として図面の右方向に湾曲した後、さらに右方向に

延びた形状に形成される。次に、基板１１のコア層１２が形成された側の面上の、コア層１２の上面に接着剤を塗布し、さらにその上に金属フィルムを貼着して導電層１３を形成する。この金属フィルムは基板１１に形成される電気配線経路に応じたパターンに形成されており、この金属フィルムを基板１１上に貼着することにより所望の電気配線の経路に沿った導電層１３が形成される。接着剤としては、形成される接着剤層１４がコア層１２に対するクラッドとして作用する材料を用いる（図１（ｄ））。次に、導電層１３の上にレジスト１０を塗布して異方性エッチングにより、導電層１３が不必要な個所及び光学的接続をする個所の導電層１３及び接着剤層１４を除去する（図１（ｅ）及び図１（ｆ））。次に、異方性エッチングにより形成された穴１０ａ（図１（ｆ））の中に、コア層１２と同一材料より成る光接続部１６をＣＶＤ法（Ｃｈｅｍｉｃａｌ　Ｖａｐｏｒ　Ｄｅｐｏｓｉｔｉｏｎ　Ｍｅｔｈｏｄ）により成長させ、レジスト１０を剥離し、形成された光接続部１６を加熱することによりレンズ状の光接続部１６に整形する（図２（ａ））。さらに、導電層１３の上にレジスト１０を塗布し、バンプを形成するための穴１０ｂを開けた（図２（ｂ））後、金属メッキ法によりその穴１０ｂ内にバンプ１５を成長させる（図２（ｃ））。次に、レジスト１０を剥離し、バンプ１５を加熱することによりバンプ１５を半球形に整形する（図２（ｄ））。このようにして、新たな光電気伝送路を形成するための第１の基板が完成する。

【００１６】次に、この第１の基板を、他の基板と貼り合わせることにより新たな光電気伝送路が形成される過程について説明する。図３は、上記実施形態により形成された第１の基板を他の基板と貼り合わせることにより新たな光電気伝送路が形成される過程についての説明図である。図２（ｄ）に示した第１の基板１１の上に、図３（ａ）に示すように、基板１１’上にコア層１２’、接着剤層１４’、導電層１３’、及び電極１７が形成された第２の基板１１’を載せ、第２の基板１１’の電極１７と第１の基板１１のバンプ１５とを位置合わせする。次に、ＬＳＩパッケージング技術の一つであるＴＡＢ（Ｔａｐｅ　Ａｕｔｏｍａｔｅｄ　Ｂｏｎｄｉｎｇ）技術によりこれら２枚の基板１１，１１’どうしを圧着する。ＴＡＢ技術により、第２の基板１１’の電極１７と第１の基板１１のバンプ１５とは分子レベルで強固に接着される。このようにして、図３（ｂ）に示すように、新たな光電気伝送路を形成する光電気配線基板１００が完成する。このように、２枚の基板１１，１１’どうしがＴＡＢ技術により圧着されることにより、２枚の基板１１，１１’の各コア層１２，１２’の先端に形成された各光接続部１６，１６’及びレンズ１６ａ，１６ａ’どうしの位置合わせが自動的に行われる。ＴＡＢ技術によりバンプ１５と電極１７とは分子レベルで強固に

結合し一体化されると共に、２枚の基板１１，１１’上の各導電層１３，１３’どうしがバンプ１５と電極１７とを介して電気的に接続され、かつ、２枚の基板１１，１１’に形成されたコア層１２，１２’どうしが光学的に接続されて、光電気配線基板１００が形成されている。

【００１７】次に、図１及び図２に示した第１の基板の形成方法と異なる方法による、他の実施形態について説明する。図４は、本発明の第１の光電気伝送路の形成方法の他の実施形態における第２の基板の形成過程のうちの前半部を示す工程図であり、図５は、本発明の第１の光電気伝送路の形成方法の他の実施形態における第２の基板の形成過程のうちの後半部を示す工程図である。

【００１８】以下に、図４及び図５を参照しながら第２の基板の形成過程について説明する。図４（ａ）～図４（ｆ）は、図１（ａ）～図１（ｆ）の図面の上下が反対になっているだけであり、本質的には同一工程であるため説明を省略する。図５（ａ）には、図４（ａ）～図４（ｆ）に示す工程によって製造された第２の基板２１が示されている。第２の基板２１上には、コア層２２、接着剤層２４、導電層２３、及び光接続部２６上に形成されたレンズ２６ａが表面に形成されている。次に、この第２の基板２１とは別に、第３の基板を用意する。すなわち、図５（ａ）に示すように、先ず、ガラス製の第３の基板３１の表面に電極３８を形成し、電極３８及び第３の基板３１の上にレジスト１０を塗布し、次に、電極３８上に塗布されたレジスト１０に穴１０ａ，１０ｂを開けその穴１０ａ，１０ｂ内に金属メッキにより金属層を成長させて導電性の突起３５を形成する（図５（ｂ））。次に、ＴＡＢ技術により第３の基板３１と前述の第２の基板２１とを圧着することにより突起３５と導電層２３とは分子レベルで強固に接着される。突起３５を導電層２３に接着させた後、第３の基板３１を第２の基板２１から剥離することにより、突起３５は第２の基板２１に転写される（図５（ｃ））。この剥離の際に、突起３５と導電層２３との接着面積は突起３５と電極３８との接着面積より大きいため、突起３５と導電層２３との接着面で剥離されることはなく、突起３５と電極３８との接着面で剥離される。このようにして、新たな光電気伝送路を形成するための第２の基板２１が完成する。

【００１９】この第２の基板を、他の基板と貼り合わせることにより新たな光電気伝送路を形成することができる。その結果形成される光電気配線基板の構造は、前述の第１の基板１１（図１及び図２参照）から形成される光電気配線基板の構造（図３参照）とほぼ同様であるため説明は省略する。次に、本発明の第２の光電気伝送路の形成方法の実施形態について説明する。

【００２０】図６は、本発明の第２の光電気伝送路の形成方法の一実施形態における第１の基板の構造を示す模式図であり、図７は、図６に示した第１の基板を、第２の基板に貼り合わせることにより形成された光電気配線基板の構造を示す模式図である。なお、図６に示した第１の基板４１の構造は、前述の図４（ｃ）に示した第２の基板２１の構造と同様である。すなわち、光の伝送路のクラッドとして作用する基板４１と、光の入射または出射を担う光接続部４６を有する光の伝送路となるコア層４２と、基板４１のコア層４２が形成された側の面上に形成されたコア層４２に対するクラッドとして作用する材料から成る接着剤層４４と、その上に、電気配線の経路に沿って形成された導電層４３と、この導電層４３上に形成され導電層４３を、接続相手の導電層と電気的に接続するための導電性の突起４５とから成る。コア層４２の光接続部４６の先端には、光の入射あるいは出射の効率を高めるため凸レンズ状のレンズ４６ａが形成されている。

【００２１】図７には、図６に示した第１の基板４１と接続された状態の第２の基板４９が図面の下方に示されている。第２の基板４９には、レーザダイオード４７と電極４８とが備えられている。レーザダイオード４７は第２の基板４９の表面層に形成された凹部４９ａ内に設置されており、その出力は第２の基板４９に備えられた電子回路（図示せず）に接続される。電極４８は第２の基板４９上に形成されており、電極４８を介して入出力される電気信号は第２の基板４９に備えられた電子回路（図示せず）に接続される。

【００２２】この第２の基板４９の上に前述の第１の基板４１を載せ、第２の基板４９の電極４８と、第１の基板４１の導電性の突起４５とを精度よく位置合わせした後、２枚の基板４１，４９どうしをＴＡＢ技術により圧着することにより、第１の基板４１のコア層４２の先端に形成された光接続部４６と第２の基板４９のレーザダイオード４７とが自動的に位置合わせされ、図７に示すように、突起４５と電極４８とは強固に接合されて第１の基板４１と第２の基板４９とが一体化されると共に、第１の基板４１の導電層４３と第２の基板４９の電極４８とが突起４５を介して電気的に接続され、かつ、第１の基板４１のコア層４２の先端に形成された光接続部４６と第２の基板４９のレーザダイオード４７とが光学的に接続されて、光電気配線基板４００が完成する。

【００２３】なお、第１の基板４１の形成方法は、図３（ａ）～図４（ａ）に示した第２の基板２１の形成方法と同様である。第２の基板４９は、図７に示すように、基板４９の表面層に凹部４９ａを形成しその内部にレーザダイオード４７を設置し、さらに基板４９上に電極４８を形成することによって製造される。次に、本発明の第２の光電気伝送路の形成方法の他の実施形態について説明する。

【００２４】図８は、図７に示した光電気配線基板の構造を若干変更した実施形態についての模式図である。図

８に示すように、この実施形態では、レーザダイオード４７は第２の基板４９の表面上に載置されており、レーザダイオード４７の先端は、第１の基板４１に形成されたコア層４２の光接続部４６に接近したて位置している。この実施形態では、図７におけるような、凸レンズは形成されていない。

【００２５】図９は、図６に示した第１の基板における、コア層、接着剤層、導電層、突起、及び光接続部の配置の他の実施形態を示す斜視図であり、図１０は、図６に示した第１の基板における、コア層、接着剤層、導電層、突起、及び光接続部の配置の他の実施形態を示す断面図である。図９は、全体の斜視図を示し、図１０（ａ）～図１０（ｃ）は、それぞれ、図９に示された１点鎖線ａ－ａ’，ｂ－ｂ’，ｃ－ｃ’で切断した断面図を示している。

【００２６】図９及び図１０（ａ）～図１０（ｃ）に示すように、第１の基板４１に矢印Ａ方向に延びるコア層４２が形成されており、同様に矢印Ａ方向に延びる２本の接着剤層４４上に導電層４３が形成されている。２本の導電層４３上にはそれぞれ突起４５が形成されている。コア層４２の一端にはレンズ状の光接続部４６が形成されている。

【００２７】次に、本発明の第２の光電気伝送路の形成方法の他の実施形態について説明する。図１１は、本発明の第２の光電気伝送路の形成方法の他の実施形態における、第１の基板のコア層、接着剤層、導電層、突起、及び光接続部の配置を示す斜視図であり、図１２は、図１１に示した第１の基板のコア層、接着剤層、導電層、突起、及び光接続部の配置を示す断面図である。

【００２８】図１１は、第１の基板全体の斜視図を示し、図１２（ａ）から図１２（ｅ）は、それぞれ、図１１に示された１点鎖線ａ－ａ’，ｂ－ｂ’，ｃ－ｃ’，ｄ－ｄ’，ｅ－ｅ’，ｆ－ｆ’で切断した断面図を示している。図１１及び図１２（ａ）～図１２（ｅ）に示すように、第１の基板５１に矢印Ａ方向に延びるコア層５２が形成されており、図１１のほぼ中央に位置するコア層５２の端部の光接続部５６の先端には凸レンズ状のレンズ５６ａが形成されている。基板５１表面の光接続部５６の先端に形成されたレンズ５６ａの周囲には接着剤層５４と導電層５３とが形成されており、さらに、導電層５３の上には光接続部５６の先端に形成されたレンズ５６ａを取り囲んで形成された環状の導電性の突起５５が形成されている。このように、導電性の突起５５を、光接続部５６と、接続相手の光接続部との光結合部分を取り囲むように環状に形成したことにより、２つの基板が貼り合わされて新たな光電気配線基板として形成された時に、導電性の突起５５で取り囲まれた空間が外部の光及び電磁波から遮蔽され、光接続部相互間で入出射される光のＳ／Ｎ比を向上させることができる。

【００２９】次に、本発明の第３の光電気伝送路の形成方法及び本発明の第４の光電気伝送路の形成方法について説明する。なお、本発明の第３及び第４の光電気伝送路の形成方法は、前述の本発明の第１及び第２の光電気伝送路の形成方法と類似しているので、上記図１１，１２を流用して実施形態について説明することとする。前述の本発明の第１及び第２の光電気伝送路の形成方法（図１１，１２参照）においては、基板５１の上に接着剤層５４及び導電層５３が形成され、その上に導電性の突起５５が形成されるが、本発明の第３及び第４の光電気伝送路の形成方法においては、基板５１の上には、クラッド層が形成され、その上に突起が形成される。このクラッド層は図１１，１２における接着剤層５４に相当するものであり、コア層５２にたいするクラッドとして作用する。このクラッド層の上には必ずしも導電層５３が形成されている必要はない。クラッド層の上に導電層５３が形成されていない場合は、突起は必ずしも導電性の材料で形成される必要はない。本発明の第３及び第４の光電気伝送路の形成方法の場合、上記突起は、貼り合わせる相手側基板との位置合わせと、光結合部分の外部との光学的な遮蔽とを目的として形成されるものであり、必ずしも突起を介しての電気的接続を行う必要はない。

【００３０】なお、上記の各実施形態のうち、本発明の第２の光電気伝送路の形成方法及び本発明の第４の光電気伝送路の形成方法に関する各実施形態において、第２の基板の、第１の基板上に形成されたコア層の光接続部に対応する位置に配置される素子がレーザダイオードである場合を例に挙げて説明したが、この素子はレーザダイオードに限定されるものではなく、第１の基板の光接続部に入射する光の発光を担う発光素子、または第１の基板の光接続部から出射する光の受光を担う受光素子のいずれか一方の素子、あるいは、発光素子と受光素子の両機能を兼ね備えたどのようなタイプの素子であってもよい。

【００３１】

【発明の効果】以上説明したように、本発明によれば、簡単な方法で、光学的位置合わせ及び電気的接続を行い結合効率の良い光伝送路及び電気伝送路が形成される。

【図面の簡単な説明】

【図１】本発明の第１の光電気伝送路の形成方法の一実施形態における第１の基板の形成過程のうちの前半部を示す工程図である。

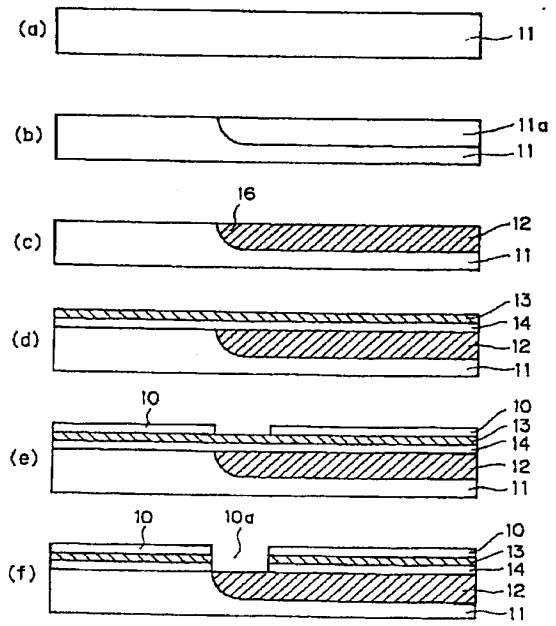
【図２】本発明の第１の光電気伝送路の形成方法の一実施形態における第１の基板の形成過程のうちの後半部を示す工程図である。

【図３】上記実施形態により形成された第１の基板を他の基板と貼り合わせることにより新たな光電気伝送路が形成される過程についての説明図である。

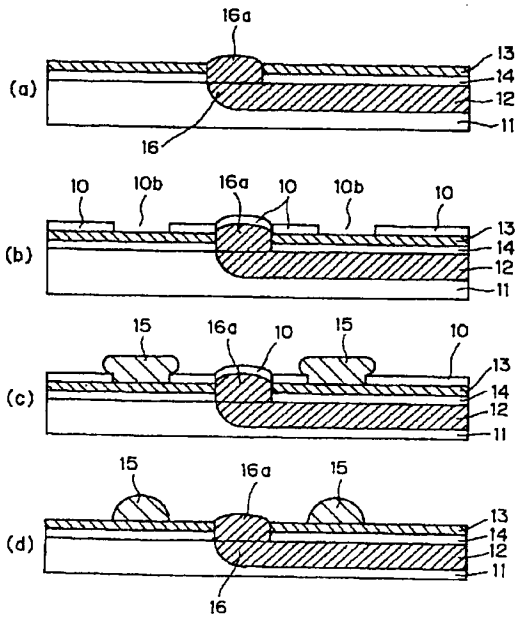
【図４】本発明の第１の光電気伝送路の形成方法の他の実施形態における第２の基板の形成過程のうちの前半部

を示す工程図である。
【図５】本発明の第１の光電気伝送路の形成方法の他の実施形態における第２の基板の形成過程のうちの後半部を示す工程図である。
【図６】本発明の第２の光電気伝送路の形成方法の一実施形態における第１の基板の構造を示す模式図である。
【図７】図６に示した第１の基板を、第２の基板に貼り合わせることにより形成された光電気配線基板の構造を示す模式図である。
【図８】図７に示した光電気配線基板の構造を若干変更した場合の模式図である。
【図９】図６に示した第１の基板における、コア層、接着剤層、導電層、突起、及び光接続部の配置の一例を示す斜視図である。
【図１０】図６に示した第１の基板における、コア層、接着剤層、導電層、突起、及び光接続部の配置の一例を示す断面図である。
【図１１】本発明の第２の光電気伝送路の形成方法の他の実施形態における、第１の基板のコア層、接着剤層、導電層、突起、及び光接続部の配置を示す斜視図である。
【図１２】図１１に示した第１の基板のコア層、接着剤層、導電層、突起、及び光接続部の配置を示す断面図である。
【符号の説明】
１１　基板１１
１２　コア層
＊１３　導電層
１４　接着剤層
１５　バンプ
１６　光接続部
１７　電極
２１　基板
２２　コア層
２３　導電層
２４　接着剤層
２６　光接続部
３１　基板
３５　突起
４１　基板
４２　コア層
４３　導電層
４４　接着剤層
４５　突起
４６　光接続部
４７　レーザダイオード（受／発光素子）
４９，５１　基板
５２　コア層
５３　導電層
５４　接着剤層
５５　突起
５６　光接続部
１００，４００　光電気配線基板

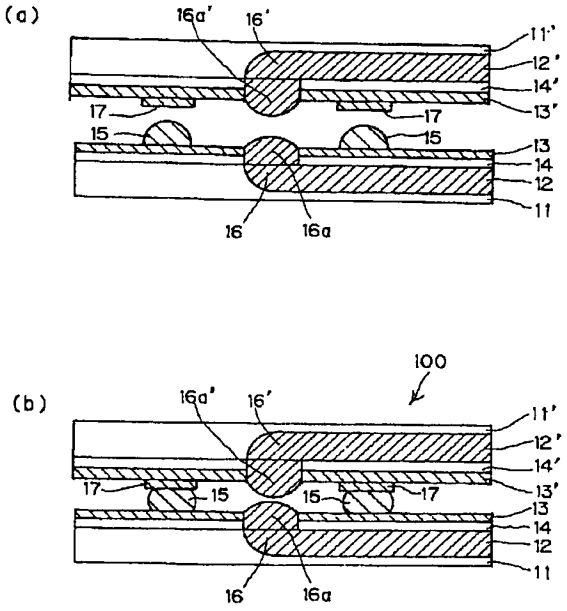
【図１】



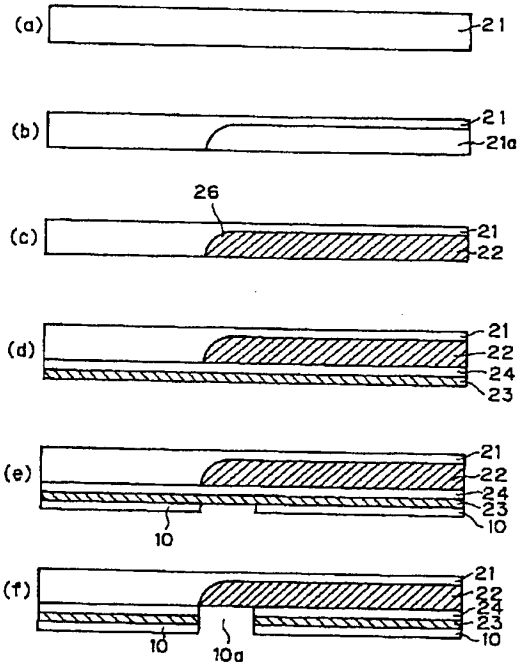
【図２】



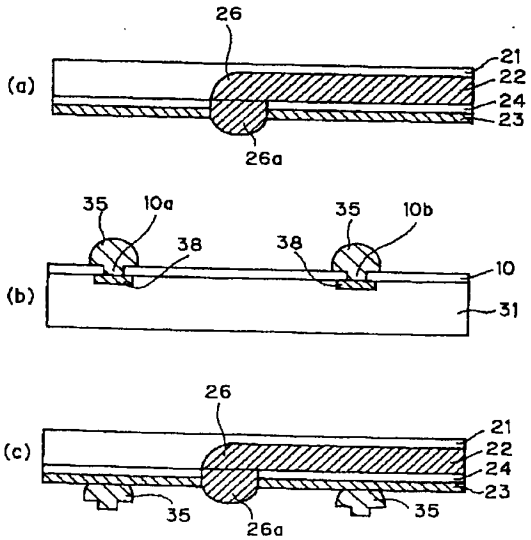
【図３】


(a)
16a'
16'
11'
12'
14'
13'
17
15
13
14
12
11
16
16a
(b)
100
16a'
16'
11'
12'
14'
13'
17
15
13
14
12
11
16
16a

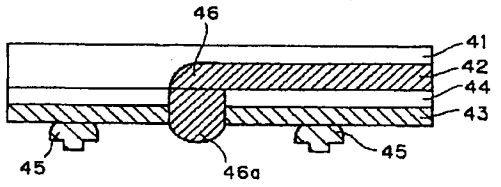
【図４】


(a)
21
(b)
21
21a
26
(c)
21
22
(d)
21
22
24
23
(e)
21
22
24
23
10
(f)
21
22
24
23
10
10
10a

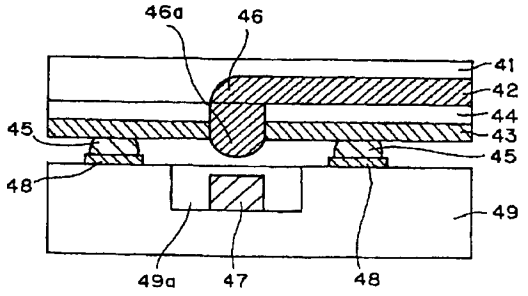
【図５】


(a)
26
21
22
24
23
26a
(b)
35
10a
38
38
35
10b
10
31
(c)
26
21
22
24
23
35
26a
35

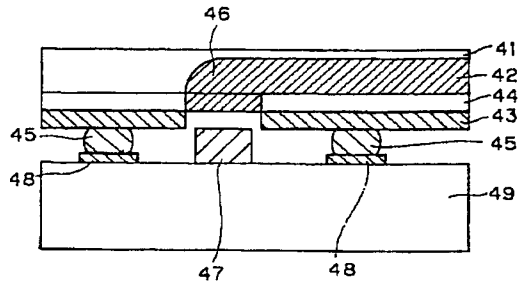
【図６】


46
41
42
44
43
45
45
46a

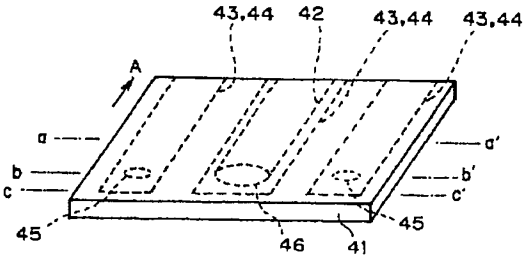
【図７】


46a
46
41
42
44
43
45
45
48
49
49a
47
48

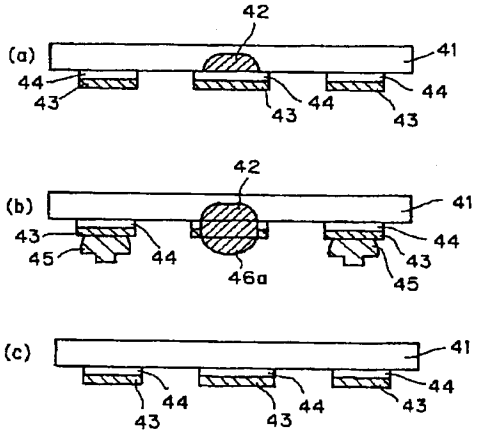
【図８】



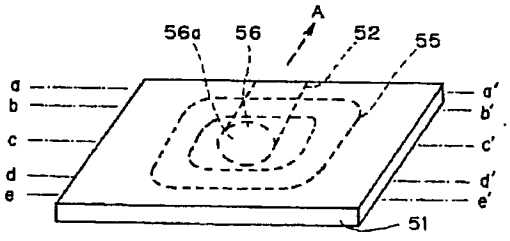
【図９】



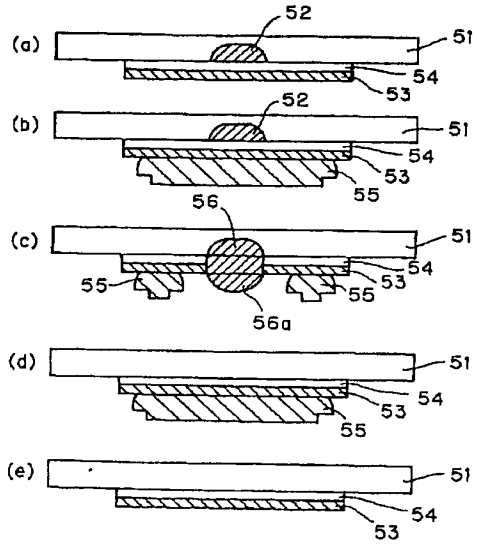
【図１０】



【図１１】



【図１２】



フロントページの続き

(72)発明者　岡田　純二
神奈川県海老名市本郷2274番地　富士ゼロックス株式会社海老名事業所内

(72)発明者　広田　匡紀
神奈川県海老名市本郷2274番地　富士ゼロックス株式会社海老名事業所内

(72)発明者　河野　健二
神奈川県足柄上郡中井町境430　グリーンテクなかい　富士ゼロックス株式会社内

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-281352
(43)Date of publication of application : 31.10.1997

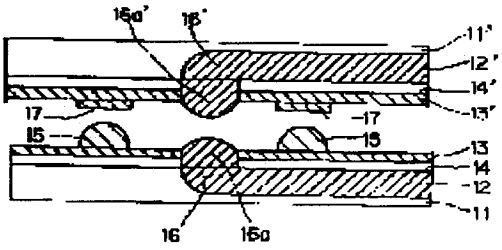
(51)Int.Cl. G02B 6/13
H01L 27/15

(21)Application number : 08-088045
(22)Date of filing : 10.04.1996

(71)Applicant : FUJI XEROX CO LTD
(72)Inventor : TAGUCHI MASAHIRO
OZAWA TAKASHI
FUNADA MASAO
OKADA JUNJI
HIROTA MASANORI
KONO KENJI

(54) FORMATION OF OPTO-ELECTRIC TRANSMISSION PATH AND OPTO-ELECTRIC WIRING BOARD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a method for forming novel opto-electric transmission paths by optically and electrically connecting the opto-electric transmission paths, optical transmission paths, opto-electric elements, optical elements, etc., to each other with good coupling efficiency by a simple method and an opto- electric wiring board having overall efficiency.
SOLUTION: This wiring board is formed by preparing two sheets of substrates 11, 11' forming respective core layers 12, 12' having optical junctures 16, 16' bearing incidence-exit of light on the respective substrates 11, 11', forming respective conductive layer 13, 13' stuck by adhesives 14, 14' consisting of material acting as clads to the respective core layers 12, 12' onto the substrates 11, 11', forming conductive projections 15 for electrical connection on the conductive layers 13 and sticking the substrates 11, 11' in such a manner that the optical junctures 16, 16' are optically connected to each other and that the respective conductive layers 13, 13' electrically connected to each other via the projections 15.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to this core layer and extending in the direction of a law everywhere in each of these two substrates The process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, The process which forms each conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to this each core layer in accordance with the path of a law the top face of each of this core layer on the field of the side in which said each core layer of said two substrates was formed, and everywhere, The process which forms the conductive projection for connecting the conductive layer on these two substrates mutually electrically at least in one side of the conductive layers formed on said two substrates, The formation approach of the photoelectricity transmission line characterized by having the process which sticks these two substrates so that said conductive layers on these two substrates may be electrically connected through said projection while said optical connections on said two substrates are connected optically.
[Claim 2] the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to this core layer -- preparing -- this, while extending in the predetermined direction on the 1st substrate The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to this core layer in accordance with the top face and the predetermined path of this core layer on the field of the side in which said core layer of said 1st substrate was formed, The light emitting device which bears luminescence of light which carries out incidence to this optical connection in the location corresponding to said optical connection of the core layer which prepared the 2nd substrate and was formed on said 1st substrate of this 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from this optical connection this -- with the process which forms the 2nd conductive layer in accordance with the predetermined path on the 2nd substrate While said optical connection and said component are optically connected with the process which forms the conductive projection for connecting electrically this 1st conductive layer and this 2nd conductive layer at least to one side of said 1st conductive layer and said 2nd conductive layer The formation approach of the photoelectricity transmission line characterized by having the process which sticks said the 1st substrate and said 2nd substrate so that said the 1st conductive layer and said 2nd conductive layer may be electrically connected through said projection.
[Claim 3] The formation approach of the photoelectricity transmission line according to claim 2 characterized by forming said 2nd conductive layer so that said component may be surrounded, and forming further so that this projection may enclose this optical connection and this component, when said projection is stuck on said the 1st substrate and said 2nd substrate while forming said 1st conductive layer so that said optical connection may be surrounded.
[Claim 4] While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to this core layer and extending in the direction of a law everywhere in each of these two substrates The process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, The process which forms each conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to this each core layer in accordance with the path of a law the top face of each of this core layer on the field of the side in which said each core layer of said two substrates was formed, and everywhere, The process which forms the conductive projection for connecting the conductive layer on these two substrates mutually electrically at least in one side of the conductive layers formed on said two substrates, The photoelectricity wiring substrate formed through the process which sticks these two substrates so that said conductive layers on these two substrates may be electrically connected through said projection while said optical connections on said two substrates are connected optically.
[Claim 5] the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to this core layer -- preparing -- this, while extending in the predetermined direction on the 1st substrate The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to this core layer in accordance with the top face and the predetermined path of this core layer on the field of the side in which said core layer of said 1st substrate was formed, The light emitting device which bears luminescence of light which carries out incidence to this optical connection in the location corresponding to said optical connection of the core layer which prepared the 2nd substrate and was formed on said 1st substrate of this 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from this optical connection this -- with the process which forms the 2nd conductive layer in accordance with the predetermined path on the 2nd substrate While said optical connection and said component are optically connected with the process which forms the conductive projection for connecting electrically this 1st conductive layer and this 2nd conductive layer at least to one side of said 1st conductive layer and said 2nd conductive layer The photoelectricity wiring substrate formed through the process which sticks said the 1st substrate and said 2nd substrate so that said the 1st conductive layer and said 2nd conductive layer may be electrically connected through said projection.
[Claim 6] While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to this core layer and extending in the direction of a law everywhere in each of these two substrates So that said optical connection may be surrounded on the process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, and the field of the side in which said each core layer of said two substrates was formed The process which forms each cladding layer to this each core layer which acts as a clad, The process which forms the projection which encloses the optical coupling part of said optical connections of said two substrates when these two substrates are stuck at least on one side of the cladding layers formed on said two substrates, The formation approach of the photoelectricity transmission line characterized by having the process which sticks these two substrates so that said projection may shield optically said optical coupling part on these two substrates with the exterior while said optical connections on said two substrates are connected optically.
[Claim 7] the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to this core layer -- preparing -- this, while extending in the predetermined direction on the 1st substrate The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st cladding layer which consists of the ingredient which acts as a clad to this core layer on the field of the side in which said core layer of said 1st substrate was formed, The light emitting device which bears luminescence of light which carries

http://www4.ipdl.inpit.go.jp/cgi-bin/tran_web_cgi_ejje?u=http%3A%2F%2Fwww4.ipdl.i... 2007/06/25

out incidence to this optical connection in the location corresponding to said optical connection of the core layer which prepared the 2nd substrate and was formed on said 1st substrate of this 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from this optical connection this -- with said optical connection of said 1st substrate, when said the 1st substrate and said 2nd substrate are stuck at least on one of the process which forms the 2nd cladding layer on the 2nd substrate, and said 1st cladding layer and said 2nd cladding layer While said optical connection and said component are optically connected with the process which forms the projection which encloses an optical coupling part with said light emitting device of said 2nd substrate, and the component of either of said photo detectors The formation approach of the photoelectricity transmission line characterized by having the process which sticks said the 1st substrate and said 2nd substrate so that said projection may shield said optical coupling part with the exterior optically.

[Translation done.]

* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the photoelectricity wiring substrate formed by the formation approach of the photoelectricity transmission line which connects optically and electrically a photoelectricity transmission line, an optical transmission line, a photoelectric element, an optical element, etc. mutually, and forms a new photoelectricity transmission line, and its approach.
[0002]
[Description of the Prior Art] It is performed by an optical fiber, an optical transmission line, or these two combination, in order to mount optical elements, such as prism and a diffraction grating, and photoelectric elements, such as a laser diode and a photodiode, in an optical circuit substrate or a photoelectricity wiring substrate and to combine an optical element and a photoelectric element optically generally. In order to make joint effectiveness as an optical circuit between an optical fiber or an optical transmission line into max, precision needs to improve a light corpuscle child, and an optical fiber or an optical transmission line alignment to a light corpuscle child. Moreover, it is necessary to supply power and an electrical signal to a photoelectric element.
[0003] Conventionally, the self-alignment approach using the surface tension of melting solder which considers as the approach of precision improving a light corpuscle child alignment to an optical circuit substrate, and mounting him in it, for example, is indicated by "a "self-alignment mounting of light corpuscle child by AuSn bump junction" electrical-and-electric-equipment information American Communications Association technical report and OQE 93-145 (1993-12)" is learned widely. This approach places bumps (ball of a pewter), such as AuSn, on the circuit pattern formed in the optical circuit substrate. After piling up the circuit pattern of the substrate equipped with the light corpuscle child who should join together on the bump, heating fusion of the bump is carried out. It is a thing of making the location gap between substrates correct by the relative movement of two substrates by the surface tension of the fused pewter, and making the alignment of two substrates perform automatically.
[0004] Although there is an advantage that the electric power supply to a substrate and transmission of an electrical signal can be performed using the bump used for alignment in this approach On the other hand, when the precision of the location in which a bump is assigned is low to this approach, the joint effectiveness of the light of two substrates may be reduced to it. Moreover, the flux for pewters tends to adhere to a light corpuscle child, and when a light corpuscle child's front face is polluted by flux, there is a problem of being easy to reduce the joint effectiveness of light.
[0005] While establishing two or more dead air space which inserts an optical element in the front face of an electronic substrate in JP,6-13601,A as other conventional techniques, the formation approach of the lightwave signal distribution system which forms the alignment carrier structure which has arranged the optical waveguide for connecting between [which should be inserted in the dead air space] optical elements is indicated. Since the dead air space in which an optical element is inserted is positioned correctly beforehand according to this approach, the

alignment actuation at the time of inserting in an optical element has the advantage from which it becomes unnecessary and attachment and detachment of an optical element become easy. Moreover, in this system, not only distribution of a lightwave signal but supply of power or an electrical signal can be performed on an electronic substrate.
[0006] However, since it is necessary to arrange on a substrate after positioning correctly the optical waveguide which connects between the dead air space and these dead air space for inserting in an optical element by this approach, structure becomes complicated, it is highly precise, and it difficult to manufacture the alignment carrier structure. Moreover, although it is easy to apply this alignment carrier structure to the component of the type which carries out light receiving and light emitting by the end face on that structure, there is also a problem that it is difficult to apply to the component which carries out light receiving and light emitting except end faces, such as a surface emission-type laser.
[0007]
[Problem(s) to be Solved by the Invention] this invention -- the above-mentioned situation -- taking an example -- an easy approach -- association -- it aims at offering a photoelectricity wiring substrate with efficient and sufficient the formation approach of the photoelectricity transmission line which connects optically and electrically a photoelectricity transmission line, an optical transmission line, a photoelectric element, an optical element, etc. mutually, and forms a new photoelectricity transmission line and joint effectiveness.
[0008]
[Means for Solving the Problem] The formation approach of the 1st photoelectricity transmission line of this invention of attaining the above-mentioned purpose While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to the core layer and extending in the direction of a law everywhere in each of these two substrates The process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, The process which forms each conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to each core layer in accordance with the path of a law the top face of each core layer on the field of the side in which each above-mentioned core layer of two above-mentioned substrates was formed, and everywhere, The process which forms the conductive projection for connecting the conductive layer on these two substrates mutually electrically at least in one side of the conductive layers formed on two above-mentioned substrates, While the above-mentioned optical connections on two above-mentioned substrates are connected optically, it is characterized by having the process which sticks these two substrates so that the above-mentioned conductive layers on these two substrates may be electrically connected through the above-mentioned projection.
[0009] Moreover, the formation approach of the 2nd photoelectricity transmission line of this invention of attaining the above-mentioned purpose While preparing the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to the core layer and extending in the predetermined direction on the substrate of the above 1st The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to a core layer in accordance with the top face and the predetermined path of a core layer on the field of the side in which the above-mentioned core layer of the 1st substrate of the above was formed, The light emitting device which bears luminescence of light which carries out incidence to an optical connection in the location corresponding to the above-mentioned optical connection of the core layer which prepared the 2nd substrate and was formed on the substrate of the above 1st of the 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from an optical connection The process which forms the 2nd conductive layer in accordance with the predetermined path on the 2nd substrate, While the above-mentioned component is optically connected with the process which forms the conductive projection for connecting the 1st conductive layer and 2nd conductive layer at least to one of the 1st conductive layer of the above, and the 2nd

conductive layer of the above electrically, and the above-mentioned optical connection It is characterized by having the process which sticks the 1st substrate of the above, and the 2nd substrate of the above so that the 1st conductive layer of the above and the 2nd conductive layer of the above may be electrically connected through the above-mentioned projection.
[0010] Here, while forming the 1st conductive layer of the above so that the above-mentioned optical connection may be surrounded, the 2nd conductive layer of the above is formed so that the above-mentioned component may be surrounded, and when the above-mentioned projection is stuck on the 1st substrate of the above, and the 2nd substrate of the above, you may form further so that the above-mentioned projection may enclose an optical connection and this component. Moreover, the 1st photoelectricity wiring substrate of this invention which attains the above-mentioned purpose While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to the core layer and extending in the direction of a law everywhere in each of these two substrates The process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, The process which forms each conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to each core layer in accordance with the path of a law the top face of each core layer on the field of the side in which each above-mentioned core layer of two above-mentioned substrates was formed, and everywhere, The process which forms the conductive projection for connecting the conductive layer on these two substrates mutually electrically at least in one side of the conductive layers formed on two above-mentioned substrates, While the above-mentioned optical connections on two above-mentioned substrates are connected optically, it is characterized by being formed through the process which sticks these two substrates so that the above-mentioned conductive layers on these two substrates may be electrically connected through the above-mentioned projection.
[0011] Moreover, the 2nd photoelectricity wiring substrate of this invention which attains the above-mentioned purpose While preparing the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to the core layer and extending in the predetermined direction on the 1st substrate The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st conductive layer stuck by the adhesives which consist of the ingredient which acts as a clad to a core layer in accordance with the top face and the predetermined path of a core layer on the field of the side in which the above-mentioned core layer of the 1st substrate of the above was formed, The light emitting device which bears luminescence of light which carries out incidence to an optical connection in the location corresponding to the above-mentioned optical connection of the core layer which prepared the 2nd substrate and was formed on the substrate of the above 1st of the 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from an optical connection The process which forms the 2nd conductive layer in accordance with the predetermined path on the 2nd substrate, While the above-mentioned component is optically connected with the process which forms the conductive projection for connecting the 1st conductive layer and 2nd conductive layer at least to one of the 1st conductive layer of the above, and the 2nd conductive layer of the above electrically, and the above-mentioned optical connection It is characterized by being formed through the process which sticks the 1st substrate of the above, and the 2nd substrate of the above so that the 1st conductive layer of the above and the 2nd conductive layer of the above may be electrically connected through the above-mentioned projection.
[0012] Moreover, the formation approach of the 3rd photoelectricity transmission line of this invention of attaining the above-mentioned purpose While preparing two substrates with which the core layer used as the transmission line of light is formed and which act as a clad to the core layer and extending in the direction of a law everywhere in each of these two substrates So that the above-mentioned optical connection may be surrounded on the process which forms each core layer which has each optical connection which bears at least one of the incidence of light, and the outgoing radiation, respectively in the location which corresponds mutually, and the

field of the side in which each above-mentioned core layer of two above-mentioned substrates was formed The process which forms each cladding layer which consists of the ingredient which acts as a clad to each core layer, The process which forms the projection which encloses the optical coupling part of the above-mentioned optical connections of these two substrates when these two substrates are stuck at least on one side of the cladding layers formed on two above-mentioned substrates, While the above-mentioned optical connections on two above-mentioned substrates are connected optically, it is characterized by having the process which sticks these two substrates so that the above-mentioned projection may shield optically the above-mentioned optical coupling part on these two substrates with the exterior.
[0013] Moreover, the formation approach of the 4th photoelectricity transmission line of this invention of attaining the above-mentioned purpose While preparing the 1st substrate with which the core layer used as the transmission line of light is formed and which acts as a clad to the core layer and extending in the predetermined direction on the 1st substrate The process which forms the core layer which has the optical connection which bears at least one of the incidence of light, and the outgoing radiation, The process which forms the 1st cladding layer which consists of the ingredient which acts as a clad to the core layer on the field of the side in which the above-mentioned core layer of the 1st substrate of the above was formed, The light emitting device which bears luminescence of light which carries out incidence to an optical connection in the location corresponding to the above-mentioned optical connection of the core layer which prepared the 2nd substrate and was formed on the substrate of the above 1st of the 2nd substrate, While arranging one [at least] component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from an optical connection When the 1st substrate of the above and the 2nd substrate of the above are stuck at least on one of the process which forms the 2nd cladding layer on the 2nd substrate, and the 1st cladding layer of the above and the 2nd cladding layer of the above, the above-mentioned optical connection of the 1st substrate of the above, While the above-mentioned component is optically connected with the process which forms the projection which encloses an optical coupling part with the component of the either the above-mentioned light emitting device of the 2nd substrate of the above or the above-mentioned photo detectors, and the above-mentioned optical connection It is characterized by having the process which sticks the 1st substrate of the above, and the 2nd substrate of the above so that the above-mentioned projection may shield the above-mentioned optical coupling part with the exterior optically.
[0014]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained. Drawing 1 is process drawing showing the first portion of the inside like the formation fault of the 1st substrate in 1 operation gestalt of the formation approach of the 1st photoelectricity transmission line of this invention, and drawing 2 is process drawing showing the second half section of the inside like the formation fault of the 1st substrate in 1 operation gestalt of the formation approach of the 1st photoelectricity transmission line of this invention.
[0015] while referring to drawing 1 and drawing 2 below -- like the formation fault of the 1st substrate -- ******** -- it explains. First, the substrate 11 which served as the operation as a cladding layer of an optical transmission line is prepared (drawing 1 (a)), and slot 11a for core layer formation which becomes the transmission line of light on a substrate 11 by the isotropic etching method is formed (drawing 1 (b)). Next, in slot 11a, the charge of core layer material is slushed and a core layer 12 is formed (drawing 1 (c)). After a core layer 12 curves rightward [of a drawing] by making into the starting point the optical connection 16 which bears the below-mentioned incidence or the outgoing radiation of light, it is formed in the configuration prolonged further rightward. Next, adhesives are applied to the top face of a core layer 12 on the field of the side in which the core layer 12 of a substrate 11 was formed, further, on it, a metal film is stuck and a conductive layer 13 is formed. This metal film is formed in the pattern according to the electric wiring path formed in a substrate 11, and the conductive layer 13 in alignment with the path of desired electric wiring is formed by sticking this metal film on a substrate 11. The ingredient on which the adhesives layer 14 formed acts as a clad to a core layer 12 as adhesives is used (drawing 1 (d)). Next, a resist 10 is applied on a conductive layer 13, and anisotropic

etching removes the conductive layer 13 and the adhesives layer 14 of a part in which a conductive layer 13 makes an unnecessary part and optical connection (drawing 1 (e) and drawing 1 (f)). Next, it operates orthopedically to the optical lens-like connection 16 by heating the optical connection 16 which the optical connection 16 which consists of the same ingredient as a core layer 12 was grown up with the CVD method (Chemical Vapor Deposition Method), exfoliated the resist 10, and was formed into hole 10a (drawing 1 (f)) formed of anisotropic etching (drawing 2 (a)). Furthermore, a resist 10 is applied on a conductive layer 13, and after opening hole 10b for forming a bump (drawing 2 (b)), a bump 15 is grown up into the hole 10b with metal plating (drawing 2 (c)). Next, a resist 10 is exfoliated and a bump 15 is orthopedically operated to a semi-sphere by heating a bump 15 (drawing 2 (d)). Thus, the 1st substrate for forming a new photoelectricity transmission line is completed.

[0016] Next, by sticking this 1st substrate with other substrates explains the process in which a new photoelectricity transmission line is formed. Drawing 3 is an explanatory view about the process in which a new photoelectricity transmission line is formed, by sticking the 1st substrate formed of the above-mentioned operation gestalt with other substrates. on the 1st substrate 11 shown in drawing 2 (d), it is shown at drawing 3 (a) -- as -- substrate 11' -- core layer 12', adhesives layer 14', conductive layer 13', and 2nd substrate 11' in which the electrode 17 was formed are carried upwards, and alignment of the electrode 17 of 2nd substrate 11' and the bump 15 of the 1st substrate 11 is carried out. Next, these two substrates 11 and 11' are stuck by pressure with the TAB (Tape Automated Bonding) technique which is one of the LSI packaging techniques. With a TAB technique, the electrode 17 of 2nd substrate 11' and the bump 15 of the 1st substrate 11 paste up firmly with a molecular level. Thus, as shown in drawing 3 (b), the photoelectricity wiring substrate 100 which forms a new photoelectricity transmission line is completed. Thus, alignment of two substrates 11, and 11 'each optical connection 16 formed at each core layer 12 of two substrates 11 and 11' and the tip of 12' by sticking comrades by pressure by the TAB technique, 16' and Lenses 16a and 16a' is performed automatically. While combining a bump 15 and an electrode 17 firmly with a molecular level with a TAB technique and being unified, each conductive layer 13 on two substrates 11 and 11' and the 13 'core layers 12 and 12 which comrades were electrically connected through the bump 15 and the electrode 17, and were formed in two substrates 11 and 11" are connected optically, and the photoelectricity wiring substrate 100 is formed.

[0017] Next, other operation gestalten by the formation approach of the 1st substrate shown in drawing 1 and drawing 2 and different approach are explained. Drawing 4 is process drawing showing the first portion of the inside like the formation fault of the 2nd substrate in other operation gestalten of the formation approach of the 1st photoelectricity transmission line of this invention, and drawing 5 is process drawing showing the second half section of the inside like the formation fault of the 2nd substrate in other operation gestalten of the formation approach of the 1st photoelectricity transmission line of this invention. .

[0018] while referring to drawing 4 and drawing 5 below -- like the formation fault of the 2nd substrate -- ******** -- it explains. The upper and lower sides of the drawing of drawing 1 (a) - drawing 1 (f) are only opposite, and since drawing 4 (a) - drawing 4 (f) are essentially the same processes, they omit explanation. The 2nd substrate 21 manufactured according to the process shown in drawing 4 (a) - drawing 4 (f) is shown in drawing 5 (a). On the 2nd substrate 21, lens 26a formed on the core layer 22, the adhesives layer 24, the conductive layer 23, and the optical connection 26 is formed in the front face. Next, the 3rd substrate is prepared independently [this 2nd substrate 21]. Namely, as shown in drawing 5 (a), an electrode 38 is first formed in the front face of the 3rd glass substrate 31. Holes 10a and 10b are made in the resist 10 which applied the resist 10 on an electrode 38 and the 3rd substrate 31, next was applied on the electrode 38, in hole 10a and 10b, a metal layer is grown up by metal plating, and the conductive projection 35 is formed (drawing 5 (b)). Next, projection 35 and a conductive layer 23 are firmly pasted up with a molecular level by sticking the 3rd substrate 31 and the 2nd above-mentioned substrate 21 by pressure with a TAB technique. After pasting up projection 35 on a conductive layer 23, projection 35 is imprinted by the 2nd substrate 21 by exfoliating the 3rd substrate 31 from the 2nd substrate 21 (drawing 5 (c)). In the case of this exfoliation, since the adhesion area

of projection 35 and a conductive layer 23 is larger than the adhesion area of projection 35 and an electrode 38, it does not exfoliate in respect of adhesion with projection 35 and a conductive layer 23, and exfoliates in respect of adhesion with projection 35 and an electrode 38. Thus, the 2nd substrate 21 for forming a new photoelectricity transmission line is completed.

[0019] A new photoelectricity transmission line can be formed by sticking this 2nd substrate with other substrates. Since the structure of the photoelectricity wiring substrate formed as a result is almost the same as the structure (refer to drawing 3) of the photoelectricity wiring substrate formed from the 1st above-mentioned substrate 11 (refer to drawing 1 and drawing 2), explanation is omitted. Next, the operation gestalt of the formation approach of the 2nd photoelectricity transmission line of this invention is explained.

[0020] Drawing 6 is the mimetic diagram showing the structure of the 1st substrate in 1 operation gestalt of the formation approach of the 2nd photoelectricity transmission line of this invention, and drawing 7 is the mimetic diagram showing the structure of the photoelectricity wiring substrate formed by sticking the 1st substrate shown in drawing 6 on the 2nd substrate. In addition, the structure of the 1st substrate 41 shown in drawing 6 is the same as the structure of the 2nd substrate 21 shown in above-mentioned drawing 4 (c). Namely, the core layer 42 used as the transmission line of the substrate 41 which acts as a clad of the transmission line of light, and the light which has the optical connection 46 which bears the incidence or outgoing radiation of light, The adhesives layer 44 which consists of the ingredient which acts as a clad to the core layer 42 formed on the field of the side in which the core layer 42 of a substrate 41 was formed, It consists of the conductive layer 43 moreover formed in accordance with the path of electric wiring, and the conductive projection 45 for being formed on this conductive layer 43 and connecting a conductive layer 43 with a connection partner's conductive layer electrically. In order to raise the effectiveness of the incidence of light, or outgoing radiation, convex lens-like lens 46a is formed at the tip of the optical connection 46 of a core layer 42.

[0021] The drawing is caudad shown for the 2nd substrate 49 in the condition of having connected with the 1st substrate 41 shown in drawing 6 in drawing 7 . The 2nd substrate 49 is equipped with the laser diode 47 and the electrode 48. The laser diode 47 is installed in crevice 49a formed in the surface layer of the 2nd substrate 49, and the output is connected to the electronic circuitry (not shown) with which the 2nd substrate 49 was equipped. The electrode 48 is formed on the 2nd substrate 49, and the electrical signal outputted and inputted through an electrode 48 is connected to the electronic circuitry (not shown) with which the 2nd substrate 49 was equipped.

[0022] The 1st above-mentioned substrate 41 is carried on this 2nd substrate 49. The electrode 48 of the 2nd substrate 49, After precision improves the conductive projection 45 of the 1st substrate 41 alignment, by sticking two substrates 41 and 49 by pressure with a TAB technique As alignment of the optical connection 46 formed at the tip of the core layer 42 of the 1st substrate 41 and the laser diode 47 of the 2nd substrate 49 is carried out automatically and it is shown in drawing 7 While projection 45 and an electrode 48 are joined firmly and the 1st substrate 41 and 2nd substrate 49 are unified The conductive layer 43 of the 1st substrate 41 and the electrode 48 of the 2nd substrate 49 are electrically connected through projection 45. And the optical connection 46 formed at the tip of the core layer 42 of the 1st substrate 41 and the laser diode 47 of the 2nd substrate 49 are connected optically, and the photoelectricity wiring substrate 400 is completed.

[0023] In addition, the formation approach of the 1st substrate 41 is the same as the formation approach of the 2nd substrate 21 shown in drawing 3 (a) - drawing 4 (a). As shown in drawing 7 , the 2nd substrate 49 forms crevice 49a in the surface layer of a substrate 49, installs a laser diode 47 in the interior, and is manufactured by forming an electrode 48 on a substrate 49 further. Next, other operation gestalten of the formation approach of the 2nd photoelectricity transmission line of this invention are explained.

[0024] Drawing 8 is the mimetic diagram about an operation gestalt which changed a little the structure of the photoelectricity wiring substrate shown in drawing 7 . As shown in drawing 8, with this operation gestalt, the laser diode 47 is laid on the front face of the 2nd substrate 49, and the tip of a laser diode 47 is approached, built and located in the optical connection 46 of

the core layer 42 formed in the 1st substrate 41. With this operation gestalt, the convex lens [as / in drawing 7] is not formed.
[0025] <A HREF="/Tokujitu/tjitemdrw.ipdl?N0000=239&N0500=1E_N/;?6=7> <:=///&N0001=538&N0552=9&N0553=000011" TARGET="tjitemdrw"> drawing 9 It is the perspective view in the 1st substrate shown in drawing 6 showing other operation gestalten of a core layer, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection. Drawing 10 It is the sectional view in the 1st substrate shown in drawing 6 showing other operation gestalten of a core layer, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection. drawing 9 -- the whole -- a perspective view -- being shown -- drawing 10 -- (-- a --) - drawing 10 -- (-- c --) -- respectively -- drawing 9 -- being shown -- having had -- a dashed line -- a-a -- ' -- b-b -- ' -- c-c -- ' -- having cut -- a sectional view -- being shown -- **** .
[0026] As shown in drawing 9 and drawing 10 (a) - drawing 10 (c), the core layer 42 prolonged in the direction of arrow-head A is formed in the 1st substrate 41, and the conductive layer 43 is formed on two adhesives layers 44 similarly prolonged in the direction of arrow-head A. On two conductive layers 43, the projection 45 is formed, respectively. The optical lens-like connection 46 is formed in the end of a core layer 42.
[0027] Next, other operation gestalten of the formation approach of the 2nd photoelectricity transmission line of this invention are explained. Drawing 11 is the perspective view in other operation gestalten of the formation approach of the 2nd photoelectricity transmission line of this invention showing the core layer of the 1st substrate, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection, and drawing 12 is the sectional view showing the core layer of the 1st substrate shown in drawing 11 , an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection.
[0028] drawing 11 -- the -- one -- a substrate -- the whole -- a perspective view -- being shown -- drawing 12 -- (-- a --) -- from -- drawing 12 -- (-- e --) -- respectively -- drawing 11 -- being shown -- having had -- a dashed line -- a-a -- ' -- b-b -- ' -- c-c -- ' -- d-d -- ' -- e-e -- ' -- f-f -- ' -- having cut -- a sectional view -- being shown -- **** . As shown in drawing 11 and drawing 12 (a) - drawing 12 (e), the core layer 52 prolonged in the direction of arrow-head A is formed in the 1st substrate 51, and convex lens-like lens 56a is formed at the tip of the optical connection 56 of the edge of the core layer 52 of drawing 11 mostly located in the center. The adhesives layer 54 and the conductive layer 53 are formed in the perimeter of lens 56a formed at the tip of the optical connection 56 of substrate 51 front face, and the annular conductive projection 55 formed by surrounding lens 56a formed at the tip of the optical connection 56 is further formed on the conductive layer 53. Thus, by having formed the conductive projection 55 annularly so that the optical coupling part of the optical connection 56 and a connection partner's optical connection might be surrounded When two substrates are stuck and it is formed as a new photoelectricity wiring substrate, the space surrounded by the conductive projection 55 is covered from an external light and an external electromagnetic wave, and the S/N ratio of the light by which close outgoing radiation is carried out between optical connections can be raised.
[0029] Next, the formation approach of the 3rd photoelectricity transmission line of this invention and the formation approach of the 4th photoelectricity transmission line of this invention are explained. In addition, since the formation approach of the 3rd of this invention and the 4th photoelectricity transmission line is similar with the formation approach of the 1st of above-mentioned this invention, and the 2nd photoelectricity transmission line, suppose it that above-mentioned drawing 11 and 12 are diverted and an operation gestalt is explained. In the formation approach (drawing 11 , 12 reference) of the 1st of above-mentioned this invention, and the 2nd photoelectricity transmission line, although the adhesives layer 54 and a conductive layer 53 are formed on a substrate 51 and the conductive projection 55 is formed on it, in the formation approach of the 3rd of this invention, and the 4th photoelectricity transmission line, a cladding layer is formed on a substrate 51 and a projection is formed on it. This cladding layer is equivalent to drawing 11 and the adhesives layer 54 in 12, and acts as a clad to a core layer 52. On this cladding layer, the conductive layer 53 does not necessarily need to be formed. When

the conductive layer 53 is not formed on the cladding layer, a projection does not necessarily need to be formed with a conductive ingredient. In the formation approach of the 3rd of this invention, and the 4th photoelectricity transmission line, the above-mentioned projection is formed for the purpose of optical electric shielding with alignment with the other party substrate to stick, and the exterior of an optical coupling part, and does not necessarily need to perform electrical installation through a projection.
[0030] In addition, it sets among each above-mentioned operation gestalt in each operation gestalt about the formation approach of the 2nd photoelectricity transmission line of this invention, and the formation approach of the 4th photoelectricity transmission line of this invention. Although the case where the component arranged in the location corresponding to the optical connection of the core layer formed on the 1st substrate of the 2nd substrate was a laser diode was mentioned as the example and explained The light emitting device which bears luminescence of light which this component is not limited to a laser diode and carries out incidence to the optical connection of the 1st substrate, Or you may be one component of the photo detectors which bear light-receiving of light which carries out outgoing radiation from the optical connection of the 1st substrate, or what type which has both the functions of a light emitting device and a photo detector of component.
[0031]
[Effect of the Invention] As explained above, according to this invention, by the easy approach, optical alignment and electrical installation are performed and an optical transmission line with sufficient joint effectiveness and an electric transmission line are formed.

[Translation done.]

* NOTICES *

JPO and INPIT are not responsible for any
damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is process drawing showing the first portion of the inside like the formation fault of the 1st substrate in 1 operation gestalt of the formation approach of the 1st photoelectricity transmission line of this invention.
[Drawing 2] It is process drawing showing the second half section of the inside like the formation fault of the 1st substrate in 1 operation gestalt of the formation approach of the 1st photoelectricity transmission line of this invention.
[Drawing 3] It is an explanatory view about the process in which a new photoelectricity transmission line is formed, by sticking the 1st substrate formed of the above-mentioned operation gestalt with other substrates.
[Drawing 4] It is process drawing showing the first portion of the inside like the formation fault of the 2nd substrate in other operation gestalten of the formation approach of the 1st photoelectricity transmission line of this invention.
[Drawing 5] It is process drawing showing the second half section of the inside like the formation fault of the 2nd substrate in other operation gestalten of the formation approach of the 1st photoelectricity transmission line of this invention.
[Drawing 6] It is the mimetic diagram showing the structure of the 1st substrate in 1 operation gestalt of the formation approach of the 2nd photoelectricity transmission line of this invention.
[Drawing 7] It is the mimetic diagram showing the structure of the photoelectricity wiring substrate formed by sticking the 1st substrate shown in drawing 6 on the 2nd substrate.
[Drawing 8] It is a mimetic diagram at the time of changing a little the structure of the photoelectricity wiring substrate shown in drawing 7 .
[Drawing 9] It is the perspective view in the 1st substrate shown in drawing 6 showing an example of a core layer, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection.
[Drawing 10] It is the sectional view in the 1st substrate shown in drawing 6 showing an example of a core layer, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection.
[Drawing 11] It is the perspective view in other operation gestalten of the formation approach of the 2nd photoelectricity transmission line of this invention showing the core layer of the 1st substrate, an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection.
[Drawing 12] It is the sectional view showing the core layer of the 1st substrate shown in drawing 11 , an adhesives layer, a conductive layer, a projection, and arrangement of an optical connection.
[Description of Notations]
11 Substrate 11
12 Core Layer
13 Conductive Layer
14 Adhesives Layer
15 Bump

16 Optical Connection
17 Electrode
21 Substrate
22 Core Layer
23 Conductive Layer
24 Adhesives Layer
26 Optical Connection
31 Substrate
35 Projection
41 Substrate
42 Core Layer
43 Conductive Layer
44 Adhesives Layer
45 Projection
46 Optical Connection
47 Laser Diode (Carrier/Light Emitting Device)
49 51 Substrate
52 Core Layer
53 Conductive Layer
54 Adhesives Layer
55 Projection
56 Optical Connection
100,400 Photoelectricity wiring substrate

[Translation done.]